

GR No. 19 Emergency Power Supply for Electrically Operated Gyroscopic Bank and Pitch Indicators (Artificial Horizons)

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I Introduction

- 1.1 Studies of those aircraft accidents and incidents in recent years which have involved total loss, or interruption, of generated electrical supplies on public transport aircraft, indicate that a major factor in the ability of the crew to maintain safe flight is the continuation of presentation to the pilot of reliable aircraft attitude information. Two fatal accidents since 1968 have been attributed to failure of power supplies resulting in the loss of horizon information for flight in blind conditions. Incidents have also occurred which could have been catastrophic if the crew had been totally dependent on horizon instrument, rather than visual, information.
- 1.2 All public transport aircraft operated on the United Kingdom Register the safety of which depends on electrical services, are equipped with some form of standby or emergency electrical power supply. On many aircraft these emergency supplies are provided by batteries of sufficient capacity to maintain essential services for a flight time sufficient to reach an airfield and make a landing. However, on a number of aircraft types the adequacy and duration of these supplies is critically dependent on crew response time in recognising the emergency, and in completing particular drills to isolate the battery supply to prevent it being discharged into loads on the main electrical system. It is considered that the ability of the crew to cope with a major interruption of electrical supplies would be improved if they had knowledge that continuity of horizon information was not totally dependent on their prompt and correct execution of emergency drills.
- 1.3 The purpose of this Generic Requirement is to require the retrospective modification of certain classes of aircraft to ensure that continuity of horizon information is maintained.
- 1.4 Aircraft types fitted with air driven gyroscopic bank and pitch indicators are exempt from the requirements of this Generic Requirement.

2 Requirement

- 2.1 Compliance with paragraphs 2.2 and 2.3 of this Generic Requirement, or with an approved alternative providing an equivalent level of safety, is required as soon as practical but not later than 1st January 1974, for:
 - a) aircraft operated for the purposes of public transport and certificated for the carriage of more than 19 persons over the age of three years; and
 - b) aircraft the maximum authorised weight of which exceeds 15,900 kg.
- 2.1.1 Where it can be shown that an aircraft detailed in 2.1 a) or b) will be permanently removed from service prior to the 1st January 1975, the CAA may, on application, waive the requirements of this Generic Requirement where it is satisfied that compliance would not be justified in the circumstances of the particular case.
- 2.1.2 Compliance will also be required for newly constructed aircraft the maximum authorised weight of which exceeds 5700 kg, for which a UK Certificate of Airworthiness is first issued on or after 1st January 1974, where such an aircraft is operated for the purposes of public transport.

- 2.2 Where it cannot be shown that in the event of a total failure of the main electrical generating system, an adequate supply will be available automatically to a suitable bank and pitch indicator for a minimum period of 30 minutes, assuming that no special crew action is taken for 10 minutes, then a separate emergency supply, independent of the aircraft electrical generating system, which will automatically supply such an instrument, and its associated lighting, for a minimum period of 30 minutes, shall be provided.
- 2.2.1 Where the emergency supply is provided by a separate battery it is permissible for this battery to be (trickle) charged from the main electrical generating system, provided that the installation is such that the battery cannot discharge back into the main system.
- 2.3 The instrument supplied in accordance with paragraph 2.2 shall be
- a) the third instrument (standby horizon) where this is provided, or failing such provision,
 - b) the bank and pitch indicator fitted to the Captain's flight instrument panel.
- 2.3.1 Where the third instrument is fitted it shall:
- a) Operate independently of any other attitude indicating system.
 - b) Be so located on the instrument panel that it will be visible to, and usable by, both pilots from their normal positions.
 - c) Be compatible in presentation with the main attitude indicating system.
 - d) Be fitted with a failure warning device.
- Alternatively a means of indicating that the power supply to the instrument is operating correctly shall be provided.
- 2.3.2 Where the instrument on the Captain's flight instrument panel is utilised:
- a) The circuitry to the instrument shall be modified, as necessary, so that transfer to the emergency source of supply is automatically effected in the event of failure of the main supply.
 - b) The requirements of paragraph 2.3.1d) shall be met.

3 Additional Information

- 3.1 Representations have been made to CAA that under conditions of widespread adverse weather, or heavy traffic density at airports, a period of 30 minutes may be a less than desirable time for flight to a suitable airfield and landing, and clearly this period by itself is inadequate for long range aircraft.
- 3.1.1 The basis of UK certification of all long range, and of certain short/medium range, aircraft types is that after a period of interruption of electrical supplies it will be possible for the crew to re-establish sufficient normal, or emergency, generated power to support all necessary essential services, including the instrument covered by this Generic Requirement, for the remainder of the flight. The prescribed period of 30 minutes is considered to be adequate to allow for appropriate crew action for this class of aircraft.
- 3.1.2 For those shorter range aircraft that are totally dependent on battery power to support all essential services to the completion of the flight, a period of 30 minutes assuming a crew delay time of 10 minutes, is the mandatory minimum endurance of the emergency supply for the horizon instrument prescribed in this Generic Requirement. It is, however, strongly recommended that in circumstances where the crew do take prompt and correct actions in response to warning indications of the interruption of all generated electrical power, the aircraft installation should include adequate battery capacity to

provide a 60 minute supply for both the subject instrument and the other services essential to complete the flight and make a landing.

- 3.2 A number of aircraft types already comply with the requirements of this Generic Requirement, or incorporate other special features which have been considered and accepted by the CAA as providing an equivalent level of safety.
- 3.3 In the case of aircraft types, of UK construction, which do not comply, discussions have been held with the Aircraft Constructors. Owners and Operators of such aircraft are, therefore, recommended to contact the Constructor concerned for information regarding suitable modifications.